The media can be designed such that the row and column electrical connections are all routed to one edge. The media can be assembled with electronic drivers to form a display. The display can be constructed such that it can be rolled or folded to reduce the assembly size for transportation or storage. Two or more media can be joined together to form a display.

[0035] The display media can be a polymer dispersed imaging material, for example, liquid crystal or electrophoretic materials. The display media can contain an electrically imageable material which can be addressed with an electric field and then retain its image after the electric field is removed, a property typically referred to as "bistable." Particularly suitable electrically imageable materials that exhibit "bistability" are chiral nematic, or cholesteric, liquid crystals.

[0036] According to one embodiment, cholesteric liquid crystal can be used as the imaging material. Cholesteric liquid crystal refers to the type of liquid crystal having finer pitch than that of twisted nematic and super-twisted nematic used in commonly encountered LC devices. Cholesteric liquid crystals are so named because such liquid crystal formulations are commonly obtained by adding chiral agents to host nematic liquid crystals. Cholesteric liquid crystals may be used to produce bistable or multi-stable displays. These devices have significantly reduced power consumption due to their nonvolatile "memory" characteristic. Because such displays do not require a continuous driving circuit to maintain an image, they consume significantly reduced power. Cholesteric displays are bistable in the absence of an electric field. The two stable textures are the reflective planar texture and the weakly scattering focal conic texture. Adjusting the concentration of chiral dopants in the cholesteric material modulates the pitch length of the mesophase and, thus, the wavelength of radiation reflected. Cholesteric materials that reflect infrared radiation and ultraviolet have been used for purposes of scientific study. Commercial displays are most often fabricated from cholesteric materials that reflect visible light.

[0037] A problem with typical memory type cholesteric liquid crystal displays is that they are pressure sensitive. If the display media is flexed, thereby applying pressure to the liquid crystals in the display, the display can change state, thereby obscuring the data written on the display. This is particularly a problem for use in front of a touch screen where the display will be repeatedly flexed. Other bistable display media have additional pressure sensitivity problems. Most electrophoretic materials are destroyed with applied pressure. Therefore, the display media needs to be pressure insensitive.

[0038] U.S. Pat. No. 6,853,412 discloses a pressure insensitive display media containing a polymer dispersed cholesteric liquid crystal layer. The polymer dispersed cholesteric liquid crystal layer includes a polymeric dispersed cholesteric liquid crystal (PDLC) material, such as the gelatin dispersed cholesteric liquid crystal material. One preferred method of making such emulsions, using limited coalescence, is disclosed in EP 1 115 026A. Liquid crystal materials disclosed in U.S. Pat. No. 5,695,682 may be suitable if the ratio of polymer to liquid crystal is chosen to render the composition insensitive to pressure. Application of electrical fields of various intensity and duration can drive a cholesteric material into a reflective state, to a transmissive state, or an intermediate state. These materials have the advantage of maintaining a given state indefinitely after the field is removed. Cholesteric liquid crystal materials can be MERCK BL112, BL118, or BL126, available from E.M. Industries of Hawthorne, N.Y.

[0039] A cholesteric liquid crystal composition can be dispersed in a continuous matrix. Such materials are referred to as "polymer dispersed liquid crystal" materials or "PDLC" materials. Such materials can be made by a variety of methods. For example, Doane et al. (*Applied Physics Letters,* 48, 269 (1986)) disclose a PDLC comprising approximately 0.4 μm droplets of nematic liquid crystal 5CB in a polymer binder. A phase separation method is used for preparing the PDLC. A solution containing monomer and liquid crystal is filled in a display cell and the material is then polymerized. Upon polymerization, the liquid crystal becomes immiscible and nucleates to form droplets. West et al. (Applied Physics Letters 63, 1471 (1993)) disclose a PDLC comprising a cholesteric mixture in a polymer binder. Once again, a phase separation method is used for preparing the PDLC. The liquid crystal material and polymer (a hydroxy functionalized polymethylmethacrylate) along with a crosslinker for the polymer are dissolved in a common organic solvent toluene and coated on an indium tin oxide (ITO) substrate. A dispersion of the liquid crystal material in the polymer binder is formed upon evaporation of toluene at high temperature. The phase separation methods of Doane et al. and West et al. require the use of organic solvents that may be objectionable in certain manufacturing environments. These methods can be applied to other imaging materials, such as electrophoretic materials, to form polymer dispersions of the imaging materials.

[0040] Each discrete polymer-dispersed portion of imaging material is referred to as a "domain." The contrast of the display is degraded if there is more than a substantial monolayer of domains. The term "substantial monolayer" is defined by the Applicants to mean that, in a direction perpendicular to the plane of the display, there is no more than a single layer of domains between the electrodes at most points of the imaging layer, preferably at 75 percent or more of the points, most preferably at 90 percent or more of the points of the imaging layer. In other words, at most, only a minor portion (preferably less than 10 percent) of the points of the imaging layer in the display has more than a single domain (two or more domains) between the electrodes in a direction perpendicular to the plane of the display, compared to the amount of points (or area) in the imaging layer at which there is only a single domain between the electrodes.

[0041] The amount of material needed for a monolayer can be accurately determined by calculation based on individual domain size, assuming a fully closed packed arrangement of domains. (In practice, there may be imperfections in which gaps occur and some unevenness due to overlapping droplets or domains.) On this basis, the calculated amount is preferably less than about 150 percent of the amount needed for monolayer domain coverage, preferably not more than about 125 percent of the amount needed for a monolayer domain coverage, more preferably not more than 110 percent of the amount needed for a monolayer of domains. Furthermore, improved viewing angle and broadband features may be obtained by appropriate choice of differently